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PROGRAM LIBRARY

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TITLE	SELF-TEACHING PROGRAM FOR FOCAL
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SELF-TEACHING PROGRAM FOR FOCAL

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This program for teaching FOCAL is used routinely on a PDP-15 and has been tested on a PDP-8. The tapes that are supplied contain the LIBRARY IN feature, and the program has been divided into four parts to fit the memory partitions for Multi-User FOCAL with a PDP-15. By deleting the LIBRARY IN commands, the tapes can all be loaded at once if permitted by the available core size. For use with a PDP-8, with a small memory, earlier portions of the program must be erased to provide room for subsequent portions. It would be very easy to modify the program or to use parts of it in other programs.

The following instructions are given to each user:

Guide Sheet for Self-Teaching FOCAL Program

The idea is to leave the program to try FOCAL commands and to return to the program to learn new concepts.

To Leave: while depressing CNTRL, hit P

To Return: Type G, space, statement number, and hit RETURN

Terminate commands by RETURN

Reentry points:

1:01	Start of Program	2.79	Several commands per line
1.13	More information about GO	3.10	TYPE with writing & numbers/wait 30 sec.
1.23	WRITE	3.20	ASK
1.25	More on WRITE	3.30	DO
1.32	TYPE	3.38	More about DO
1.38	More about TYPE	3.50	IF
2.01	Arithmetic symbols/wait 30 sec.	3.54	More about IF
2.37	More about math	3.60	Program to average grades
2.39	Operation as a desk calculator	3.79	FOR
2.44	Operational mathematics	3.86	More about FOR
2.60	Symbols and SET	4.01	Closing remarks/wait 30 sec.

Common Mistakes

1. The asterick* indicates that it is OK for a command. Use CNTRL P at any time to get*.
2. There must be a space after a command, e.g. G 1.12
3. A colon (:) means to type in information or to use RETURN to continue on. It is not OK for a command.

E A

C FOCAL15 V9A

01.01 T !"THIS FOCAL PROGRAM TEACHES FOCAL PROGRAMING.
01.02 T !"A PROGRAM CONSISTS OF COMMANDS TO THE COMPUTER.
01.03 T !"LET'S START BY SEEING HOW TO GET AROUND IN THE
01.04 T !"PROGRAM. TO MAKE THINGS HAPPEN, USE THE RETURN KEY .
01.05 A AN," THE INSTRUCTION GO OR G (EITHER WILL WORK)
01.06 T !,"WILL START THE PROGRAM AT A GIVEN NUMBERED
01.07 T !"LOCATION. IF NO NUMBER IS GIVEN, EXECUTION
01.08 T !"STARTS AT THE LOWEST NUMBERED LOCATION IN THE ENTIRE PROGRAM.
01.09 T !"TO INTERRUPT AT ANY TIME, WHILE DEPRESSING THE
01.10 T !"KEY CONTROL (CTRL) , HIT P. I WILL MAKE IT INTERRUPT BY ITSELF
01.11 T !"SO THAT YOU CAN TRY GOING BACK TO AN EARLIER COMMAND. TYPE
01.12 T !" G 1.08 BUT OBSERVE SPACING. NEXT SEE YOUR GUIDE SHEET"; 0
01.13 T !"EVERY LINE (STATEMENT) HAS A NUMBER. THE LINES ARE
01.14 T !"IN GROUPS DESIGNATED BY THE FIRST DIGITS. EG. 1.12,1.58,
01.15 T !"1.99 ARE ALL IN GROUP 1. THERE ARE 15 GROUPS.
01.16 T !"YOU WON'T FIND MUCH ABOVE 1.50 BECAUSE THE PROGRAM HAS BEEN
01.17 T !"DIVIDED UP TO FIT SMALL COMPUTERS.
01.18 T !"EXPERIMENT IF YOU LIKE WITH G IN GROUP 1.
01.19 T !"CONSULT YOUR GUIDE SHEET FOR REENTRY POINTS.
01.20 T !"NOTE THAT THE COMPUTER TYPES * (ASTERISK) WHEN
01.21 T !"AWAITING COMMANDS. IT TYPES A COLON : WHEN
01.22 T !"EXPECTING DATA OR RETURN."; 0
01.23 T !"LET'S LEARN ABOUT WRITE (OR W). THIS COMMAND CAUSES A
01.24 T !"LINE TO BE WRITTEN OUT. FOR EXAMPLE:W 1.30. TRY IT"; 0
01.25 T !"NOTE THE STATEMENT NUMBER. YOU DIDN'T SEE THIS WHEN
01.26 T !"THE PROGRAM WAS RUNNING. IF YOU TYPE ONLY W, YOU WILL
01.27 T !"GET EVERYTHING. USE CONTROL P TO HALT THIS. IF YOU
01.28 T !"TYPE A DIGIT, YOU WILL GET EVERYTHING IN THAT GROUP.
01.29 T !"TRY W 1,W 1.20,W 1.23. USE CONTROL P TO KEEP FROM
01.30 T !"GETTING A MILE OF PAPER. IF YOU TRY TO WRITE
01.31 T !"A NON-EXISTENT STATEMENT, YOU JUST GET *
01.32 T !"NEXT LET'S SEE HOW TO MAKE THE PROGRAM TYPE THINGS OUT."
01.33 T !"THE COMMAND IS TYPE (OR T). TO JUST GET WRITING, YOU
01.34 T !"USE QUOTATION MARKS. USE THE W COMMAND TO SEE ONE OF
01.35 T !"MY LINES AS AN EXAMPLE. ""YOU CAN WRITE A PROGRAM
01.36 T !"OF YOUR OWN USING GROUP 5 WHICH I HAVE SAVED FOR YOU.
01.37 T !"TRY THE FOLLOWING :";W 5.01
01.38 T !" THE EXCLAMATION POINT IS A LINE FEED (ADVANCE PAPER)
01.39 T !"FOR THE TELETYPE. WHEN YOUR PROGRAM IS ENTERED
01.40 T !"IN GROUP 5, USE G 5.01 TO RUN IT."
02.01 L I TEACH2
02.02 QUIT
05.01 T !"HELLO OUT THERE."
05.99 T !"CONSULT YOUR GUIDE SHEET FOR REENTRY POINT."; 0
*;G

C FOCAL15 V9A

04.01 T !"THIS IS ENOUGH FOR YOUR INTRODUCTION TO FOCAL.
04.02 T !"YOU HAVE SEEN THE COMMANDS AND SHOULD BE PRETTY HANDY IN
04.03 T !"THE MECHANICAL ASPECTS OF THE LANGUAGE. AT THIS POINT,
04.04 T !"YOU MAY NEED TO STUDY PROGRAMMING TO LEARN HOW TO MAKE
04.05 T !"GOOD USE OF FOCAL.
04.10 T !!"AND SO WE SAY A FOND FAREWELL TO FOCAL, LANGUAGE OF
04.11 T !"ENCHANTMENT AS IT FADES INTO THE SUNSET OF A SMOKING TELETYPE
04.99 QUIT

C FOCAL15 V9A

02.01 T !"LET'S LEARN SOME ARITHMETIC SYMBOLS SUCH AS:
02.02 T !" + IS "+" - IS "-" * IS X (TIMES)"
02.03 T !" / IS DIVIDE"! " ↑ IS TAKE TO A POWER, E.G 3↑2=9
02.30 T !!"NOW TRY WRITING YOUR OWN PROGRAM. THE ONLY COMMAND YOU
02.31 T !"WILL NEED IS TYPE OR T. USE GROUP 6. FOR EXAMPLE
02.32 T !"YOUR PROGRAM COULD BE:"!;W 6.05
02.33 W 6.10
02.34 T !" YOU MAY NEED TO USE () TO KEEP THINGS STRAIGHT.
02.35 T !"EXECUTE YOUR PROGRAM WITH A GO 6.05. ";Q
02.37 T !" NOW TRY A PROGRAM WITH SENTENCES AND NUMERICAL ANSWERS.
02.38 T !"WRITE 6.01 TO SEE A HANDY WAY TO DO THIS.";Q
02.39 T !"YOU CAN OMIT THE NUMBERS ON YOUR STATEMENTS AND USE FOCAL
02.40 T !"AS A DESK CALCULATOR. TRY THE FOLLOWING WITH NO STATEMENT
02.41 T !" NUMBER: T 2 + 2 T 5 ↑ 3 , NO = IS USED."
02.42 T !"THE NEW * MAY BE SPACED FUNNY.";Q
02.44 T !!"LET'S LEARN SOMETHING USEFUL.
02.46 T !"FSQT IS SQUARE ROOT" !"FSIN IS SIN, (FCOS AND FTAN ALSO)
02.47 T !"FLOG IS NATURAL LOGARITHM
02.48 T !"NOW DO SOME DESK CALCULATING AND COME BACK TO 2.60
02.49 T !"AN EXAMPLE CALCULATION IS T FLOG(2)/2.303 TO GET LOG
02.50 T !"TO THE BASE 10 OF 2. TRY SOME PROGRAMS OF YOUR OWN."; Q
02.60 T !"IT IS TIME TO LEARN TO USE SYMBOLS AND THE COMMAND
02.61 T !" SET (OR S). FOCAL VARIABLES START WITH ALPHABETIC
02.62 T !"CHARACTERS AND CAN HAVE DIGITS BUT NO INTERNAL BLANKS
02.63 T !"OR PUNCTUATION MARKS. EG. X, X1, POP, MN4, ETC.
02.64 T !"IT IS PERMISSIBLE TO USE SUBSCRIPTED VARIABLES
02.65 T !"DESIGNATED X(1), MOM(3), Y1(5), Z(J), ETC. BUT DON'T
02.66 T !"WORRY ABOUT THIS FOR NOW. THE COMMAND S IS USED TO
02.67 T !"DEFINE A SYMBOL, EG. S X=5.7 OR S Y =FLOG(X)
02.68 T !"TRY WRITING YOUR OWN PROGRAM USING GROUP 7 ALONG
02.69 T !"THE LINES OF THE FOLLOWING:"!;W 12
02.70 Q
02.79 T !"FOR CONVENIENCE, MORE THAN ONE COMMAND CAN BE ON A LINE
02.80 T !"OF THE PROGRAM. EG. "!;W 3.13
02.81 T !"TRY WRITING A COMPACT PROGRAM OF YOUR OWN BY
02.82 T !"CHANGING YOUR PREVIOUS PROGRAM. YOU CAN
02.83 T !"SIMULTANEOUSLY ERASE AND WRITE BY GIVING A NEW
02.84 T !"STATEMENT THE SAME NUMBER AS AN OLD ONE. USE GROUP 7.";Q
03.10 L I TEACH3
03.11 Q
03.13 S X=7;S Y=953;S Z=Y/X;T Z
06.01 T !"THE ANSWER ="
06.05 T 5 + 7
06.10 T 12.3/(45+67.8)
06.99 Q
12.92 S X=12.345
12.93 S Y=FLOG(X)/2.303
12.94 T !"X = ", "Y =
12.95 T X,Y

E A

C FOCAL15 V9A

03.10 T !"WE CAN MIX ANSWERS AND WRITING ON THE SAME LINE OF TYPING.
03.11 T !"FOR EXAMPLE:";W 3.13
03.12 G 3.14
03.13 T !"MY ANSWER IS Z=",Z
03.14 T !"YOU MUST HAVE CALCULATED Z PREVIOUSLY. STOP AND TRY THIS";Q
03.20 T !"A VERY USEFUL COMMAND IS ASK (OR A). THIS CAUSES THE
03.21 T !"PROGRAM TO STOP AND WAIT WHILE YOU TYPE IN A NUMBER.
03.22 T !"FOR EXAMPLE: A X ALLOWS YOU TO TYPE IN A VALUE FOR X.
03.23 T !"YOU CAN USE QUOTES TO WRITE BEFORE IT ASKS"!;W 3.25
03.24 G 3.26
03.25 A !"X= ",X," Y=",Y
03.26 T !"CHANGE YOUR PREVIOUS PROGRAM TO TRY THIS";Q
03.30 T !"THE DO (OR D) INSTRUCTION IS FAIRLY EASY TO UNDERSTAND
03.31 T !"BUT IT IS DIFFERENT FROM FORTRAN OR PL1 IN CASE YOU ARE
03.32 T !"USED TO PROGRAMMING IN THOSE LANGUAGES. DO SHIFTS
03.33 T !" CONTROL TO A STATEMENT OR TO A GROUP AND THE PROGRAM
03.34 T !" COMES BACK TO THE STARTING POINT WHEN IT FINDS THE
03.35 T !"COMMAND RETURN (OR R). USE WRITE 13 TO SEE A
03.36 T !"SUB-ROUTINE IN A GROUP BY ITSELF. TRY D 13 IN ONE
03.37 T !"OF YOUR PREVIOUS PROGRAMS.";Q
03.38 T !"WRITE A PROGRAM IN GROUP 8 AND USE D 8 TO EXECUTE THE
03.39 T !"ENTIRE GROUP. PUT THE D 8 COMMAND IN ANOTHER GROUP,
03.40 T !"AND NOTE HOW CONTROL SHIFTS AROUND.";Q
03.50 T !"LET'S SEE IF YOU CAN HANDLE ONE OF THE MORE DIFFICULT
03.51 T !"COMMANDS, IF (OR I). THIS IS A DECISION COMMAND WHICH
03.52 T !"ALLOWS BRANCHING IN THE PROGRAM. FOR EXAMPLE,"!;
03.53 T !" I (X-1) 3.55,3.51,3.52";Q
03.54 T !"THIS IS TRANSLATED:"!" IF X-1 IS NEGATIVE, GO TO 3.55
03.55 T !" IF X-1 = 0, GO TO 3.51"!" IF X-1 IS +,GO TO 3.52
03.56 A !"(HIT RETURN KEY)",AN
03.57 T !"PERHAPS YOU CAN UNDERSTAND THIS BETTER FROM AN EXAMPLE.";W 14
03.66 T !"THIS PROGRAM AVERAGES GRADES. EACH TIME A GRADE IS ENTERED
03.67 T !"IT INCREMENTS G. THE IF COMMAND KEEPS IT ASKING FOR GRADES
03.68 T !"UNTIL G=N, THE NUMBER OF STUDENTS. WHEN G=N, IT TYPES OUT
03.69 T !"THE ANSWERS. TRY MY LITTLE GRADE AVERAGE PROGRAM BY D 14";Q
03.79 T !"TO USE THE FOR (OR F) INSTRUCTION INTELLIGENTLY, YOU NEED
03.80 T !"TO KNOW A LOT MORE ABOUT WRITING PROGRAMS. LET'S JUST
03.81 T !"SEE AN EXAMPLE HERE AND NOT WORRY ABOUT THE DETAILS.
03.82 T !"YOU USUALLY USE SUBSCRIPTED VARIABLES OR AN INDEX OR BOTH.
03.83 T !"A TYPICAL COMMAND IS:"!;S N=2;W 3.85
03.84 G 3.86
03.85 F I=1,N;D 13;Q
03.86 T !"THIS TRANSLATES: FOR VALUES OF N STARTING AT 1 AND GOING
03.87 T !"UP IN STEPS OF 1, EXECUTE GROUP 13. WITHIN GROUP 13
03.88 T !"YOU WOULD USE I AS A SUBSCRIPT OR AN INDEX AND WOULD THUS
03.89 T !"BE DOING THE CALCULATION OVER SEVERAL TIMES WITH THESE
03.90 T !"CHANGING VALUES OF I. TRY GO 3.85 IF YOU WISH AND COME BACK
03.91 T !"TO 4.01 FOR CLOSING REMARKS";Q
04.01 L I TEACH4
04.02 Q
07.99 Q
13.10 A !"GIVE ME A NUMBER.",NU
13.20 S NSQ=NU * NU
13.30 T !"THE SQUARE OF YOUR NUMBER = ",NSQ
13.98 RETURN

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14.60 A !"GRADE AVERAGES!"! "NUMBER OF STUDENTS = ",N
14.61 S G=0.0;S SUM=0.0
14.62 I (G-N) 14.63,14.64,14.64
14.63 S G=G+1;A !"GRADE = ",V;S SUM=SUM+V;G 14.62
14.64 S AVE=SUM/N;T !"AVERAGE = ",AVE
14.99 T !!;G 5.98
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*;G
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